

## Information Processing

Psychology 435

Fall 2009

Crown 141

Tues 4:15-6:45p

Professor

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Damen 1043

Office Hours: Wed 3 – 5p or by appointment

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### Course Description and Goals

The way that information is represented and processed in the brain is central to a broad range of topics in psychological science. In this course we will consider how the methods of cognitive neuroscience including brain imaging (e.g., EEG/ERP/ERO, fMRI, MEG) and dissociation-based techniques such as neuropsychology and TMS, have revolutionized the exploration of these topics. We will pay particular attention to how these techniques can be used to understand higher-level cognition during development and in questions related to social psychology and psychopathology. Class participants will be introduced to these techniques, read, present, and discuss results from the primary literature, and also have an opportunity to develop an idea relating to their own research incorporating one or more of these methods.

### Prerequisites

While there are no formal prerequisites for this course a strong background in research methods, cognitive psychology, and or neuroscience will help.

### Materials

There is no required text for this course. Instead we will be reading articles from the primary literature and several edited book chapters. I will make these available on Blackboard.

### Expectations

1. I expect you to be an intellectual partner in this class, being responsible for your own learning as well as that of others (including ME!). This includes thoroughly reading the assigned articles or chapters before class. I expect that when it is your turn to present you will seek my help in preparation and will make good use of the classes' time.
  2. I expect you to come to class and be there the whole time. When you can't be in class I expect you to communicate that to me before your absence. When you are in class I expect you to be focused on class. No cell phones, texting, or emailing during class. Believe me, this hurts me even more than it hurts you and I will behave so I expect you to as well.
  3. I expect academic honesty. Do your own work and cite other people's ideas correctly.
  4. I expect us to laugh and have fun in class!
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### Assignments & Assessment

1. **Participation (20 pts).** I expect you to be at class, have read the assigned readings prior to class, and actively participate in class discussion.
2. **Paper Discussion (20 pts).** You will be responsible for leading discussion on one paper during the first 9 weeks of class. You should be prepared to take about 20-30 minutes to introduce the paper. This includes covering the authors' motivations including relevant background literature. You will also want to make sure the hypotheses and methods are clear and briefly summarize the results and what they mean. Remember, not everyone studies what you do, so make sure to communicate to the whole class. I think you will be most successful if you organize your remarks with a few PowerPoint slides. Lastly, you will lead a discussion of the paper with me, so it would be a good idea to have a couple of questions to ask the class to get things started. As a part of this you should plan to come to office hours **THE WEEK BEFORE** your week to go over your paper with me. If you can't come during my scheduled office hour (Wednesday 3-5p) we will find another time before the weekend.

3. **Project Presentation (20 pts).** As a part of the class you will be developing an idea related to your own research or interests that uses a Cognitive Neuroscience method. Ultimately you will work this idea into a NRSA Research Plan, but this presentation is for you to try out your idea on the class before you get too far along in writing. You should organize your remarks with a few PowerPoint slides much like in the paper discussion and cover similar topics; however, I don't see this presentation as a "speech", rather it should be an informal discussion for your to get good feedback. As a part of this you should plan to come to office hours *THE WEEK BEFORE* your week to go over your idea with me. If you can't come during my scheduled office hour we will find another time before the weekend.
4. **NRSA Research Plan (30pts).** The single best thing you can do during your graduate school experience is to develop a research idea into an NRSA Grant Application. While it may not be practical for you to do your plan here at Loyola, the NIH also awards Poc-Doc NRSA's. Thus, if you really think your idea is good you can look for a Post-Doc opportunity where you might be able to do your project and apply for your own funding (a great way to get a post-doc, because you are free to your mentor).

The full application is quite involved, but for this class I just want you to develop the research plan, which is up to ten single-spaced pages. The plan includes: Specific Aims, Background and Significance, Research Design and Methods including a description of Preliminary Studies. You will also want to include a Literature Cited section (not included in the ten pages). The plan should be written in APA style including Literature Cited. The full instructions for an NRSA application may be found on Blackboard under assignments; however, you should pay particular attention to Part I. I will also provide you with several examples of research plans during the next couple of weeks.

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\* Discussion to be lead by student

WEEK	DATE	REMINDERS
1	1/19	First Class
2	1/26	Neuropsychology Feinberg T.E., & Farah M.J. (1997). The development of modern behavioral neurology and neuropsychology. In T.E. Feinberg & M.J. Farah (Eds.), <i>Behavioral Neurology and Neuropsychology</i> . (pp. 3-23). New York, NY: McGraw-Hill. Damasio, H., & Damasio, A.R. (2000). The lesion method in cognitive neuroscience. In T.E. Feinberg & M.J. Farah (Eds.), <i>Patient-based approaches to Cognitive Neuroscience</i> . (pp. 21-34). Cambridge, MA: MIT Press. *Waltz, J. A., Knowlton, B. J., Holyoak, K. J., Boone, K. B., Mishkin, F. S., de Menezes Santos, M., Thomas, C. R., & Miller, B. L. (1999). A system for relational reasoning in human prefrontal cortex. <i>Psychological Science</i> , <i>10</i> , 119-125. *Morrison, R.G., Krawczyk, D., Holyoak, K.J., Hummel, J.E., Chow, T., Miller, B., & Knowlton, B.J. (2004). A neurocomputational model of analogical reasoning and its breakdown in frontotemporal lobar degeneration. <i>Journal of Cognitive Neuroscience</i> , <i>16</i> , 260-271. Osaka, N., Otsuka, Y., Hirose, N., Ikeda, T., Mima, T., Fukuyama, & Osaka, M. (2007). Transcranial magnetic stimulation (TMS) applied to left dorsolateral prefrontal cortex disrupts verbal working memory performance in humans. <i>Neuroscience Letters</i> , <i>418</i> , 232-235
3	2/2	Structural Brain Imaging Mesulam, M. – M. (2000). Anatomic principles in cognitive neuroscience. In T.E. Feinberg & M.J. Farah (Eds.), <i>Patient-based approaches to Cognitive Neuroscience</i> . (pp. 63-75). Cambridge, MA: MIT Press.

- \*Tisserand, D.J., Pruessner, J.C., Arigita, J.S., van Boxtel, M.P.J., et al. (2002). Regional frontal cortical volumes decrease differentially in aging: An MRI study to compare volumetric approaches and voxel-based morphometry. *Neuroimage*, *17*, 657-669.
- \*Rogalski E J; Murphy C M; deToledo-Morrell L; Shah R C; Moseley M E; Bammer R; Stebbins G T (2009). Changes in parahippocampal white matter integrity in amnesic mild cognitive impairment: a diffusion tensor imaging study. *Behavioural neurology*, *21*, 51-61.

4 2/9

## Functional Brain Imaging: PET/fMRI

- Raichle, M.E. (2000). Functional Imaging in cognitive neuroscience. In T.E. Feinberg & M.J. Farah (Eds.), *Patient-based approaches to Cognitive Neuroscience*. (pp. 21-34). Cambridge, MA: MIT Press.
- Seidenfeld, J., Feivelson, D.J., & Fischbach, R.L. (2007). Module 1: Neuroimaging: Visualizing Brain Structure and Function. Retrieved January 19, 2010 from Neuroethics: Implications of Advances in Neuroscience website: <http://ccnmtl.columbia.edu/projects/neuroethics/module1/foundationtext/index.html#2>.
- \*Jaeggi, S.M., Seewer, R., Nirkko, A.C., Eckstein, D., Schroth, G., Groner, R., & Gutbrod, K. (2003). Does excessive memory load attenuate activation in the prefrontal cortex? Load-dependent processing in single and dual tasks: functional magnetic resonance imaging study. *Neuroimage*, *19*, 210–225.
- \*Kroger, J. K., Sabb, F. W., Fales, C. L., Bookheimer, S. Y., Cohen, M. S., & Holyoak, K. J. (2002). Recruitment of anterior dorsolateral prefrontal cortex in human reasoning: A parametric study of relational complexity. *Cerebral Cortex*, *12*, 477-485.

5 2/16

## Functional Brain Imaging: EEG/ERP/MEG

- Luck, S. J. (2005). An introduction to the event-related potentials and their neural origins. In S.J. Luck, *An Introduction to the Event-Related Potential Technique*. (pp. 1-50). Cambridge, MA: MIT Press. Pay particular attention to pages 3-34.
- Knight, R.T. (1997). Electrophysiological methods in behavioral neurology. In T.E. Feinberg & M.J. Farah (Eds.), *Behavioral Neurology and Neuropsychology*. (pp. 101-119). New York, NY: McGraw-Hill.
- \*Voss, J. L., & Paller, K. A. (2009). An electrophysiological signature of unconscious recognition memory. *Nature Neuroscience*, *12*, 349-355.
- \*Evans, K M. and Federmeier, K. D. (2007). The memory that's right and the memory that's left: Event-related potentials reveal hemispheric asymmetries in the encoding and retention of verbal information. *Neuropsychologia*, *45*, 1777-1790.

6 2/23

## Papers (3) - Social

- \*Anderson, A, Phelps, E.A. (2001). Lesions of the human amygdala impair enhanced perception of emotionally salient events. *Nature*, *411*, 305-9.
- \*Amodio, D.M., Master, S.L., Yee, C.M., Taylor, S.E. (2008). Neurocognitive components of the behavioral inhibition and activation systems: implications for theories of self-regulation. *Psychophysiology*, *45*, 11-9.
- \*Saxe, R & Kanwisher, N. (2003). People thinking about thinking people: fMRI studies of theory of mind. *Neuroimage*, *19*, 1835-42.
- \*Correll, J., Urland, G. L., & Ito, T. A. (2006). Event-related potentials and the decision to shoot: The role of threat perception and cognitive control. *Journal of Experimental Social Psychology*, *42*, 120-128.

7 3/2 Developmental

\*Wright, S.B., Matlen, B.J., Baym, C.L., Ferrer, E., & Bunge, S.A. (2008). Neural correlates of fluid reasoning in children and adults. *Frontiers in Human Neuroscience*, 1.

\*Mills, D. L., Coffey-Corina, S., & Neville, H. J. (1997). Language comprehension and cerebral specialization from 13 to 20 months. *Developmental Neuropsychology*, 13, 397-445.

Imada, T., Zhang, Y., Cheour, M., Taulu, S., Ahonen, A. & Kuhl, P. K. (2006). Infant speech perception activates Broca's area: a developmental magnetoencephalography study. *NeuroReport*, 17, 957-962.

8 3/9 Spring Break – NO CLASS

9 3/16 Papers – Clinical

\*Cannon, T. D. Thompson, P. M. van Erp, T. G. Toga, A. W. Poutanen, V. P. Huttunen, M. Lonnqvist, J. Standerskjold-Nordenstam, C. G. Narr, K. L. Khaledy, M. Zoumalan, C. I. Dail, R. Kaprio, J. (2002). Cortex mapping reveals regionally specific patterns of genetic and disease-specific gray-matter deficits in twins discordant for schizophrenia. *Proc Natl Acad Sci USA*, 99, 3228-33.

\*Sonty, S. P., Mesulam, M. - M., Weintraub, S., Johnson, N. A., Parrish, T. B., & Gitelman, D. R. (2007). Altered effective connectivity within the language network in primary progressive aphasia. *The Journal of Neuroscience*, 27, 1334-1345.

Bachman, P., Kim, J., Yee, C. M., Therman, S., Manninen, M., Lönqvist, J., Kaprio, J., Huttunen, M. O., Näätänen, R., & Cannon, T. D. (2008). Abnormally high EEG alpha synchrony during working memory maintenance in twins discordant for schizophrenia. *Schizophrenia Research*, 103, 293-297.

10 3/23 Project Presentations

11 3/30 Project Presentations

12 4/6 Project Presentations

13 4/13 Project Presentations

14 4/20 Cognitive Neuroscience Society Annual Meeting – NO CLASS

15 4/27 Wrap Up

DATES ARE TENTATIVE. ASSIGNMENT DUE DATES MAY CHANGE DURING THE SEMESTER! I will communicate changes both in class and also on Blackboard.

19 January 2010